

WHAT IS CLAIMED IS:

1. An image reproduction apparatus including an ATS generation unit, an ATS multiplexing unit, channel reproduction units, a reproduction ATS generation unit, a reproduction timing generation unit, and a multiplexing unit, wherein

a MPEG transport stream is inputted to the ATS generation unit and the ATS multiplexing unit,

the ATS generation unit detects a PCR value in the input MPEG transport stream, and outputs an Arrived Time Stamp (ATS) to the ATS multiplexing unit,

the ATS multiplexing unit multiplexes the Arrived Time Stamp and the input MPEG transport stream, and stores the multiplexed data in a storage medium,

the channel reproduction units each include a PID filter, a buffer, a packet rewriting unit, an ATS detection unit, and a PTS · DTS detection unit,

the PID filter extracts a MPEG transport stream having a PID that is to be reproduced from the storage medium, and outputs the extracted MPEG transport stream to the buffer and the PTS · DTS detection unit,

the buffer outputs a MPEG transport stream to the packet rewriting unit in accordance with a control of the multiplexing unit,

the packet rewriting unit rewrites a time that is indicated by an ATS counter, which is outputted from the reproduction timing

generation unit, as PCR, and outputs the rewritten PCR,

the ATS detection unit reads an initial value of the ATS that is multiplexed in the MPEG transport stream which is read from the storage medium, and outputs the initial value to the reproduction ATS generation unit,

the PTS · DTS detection unit detects PTS and DTS in the input MPEG transport stream, and outputs the PTS and DTS values to the reproduction timing generation unit,

the reproduction ATS generation unit selects one of the ATS values, corresponding to one channel, which are inputted from the ATS detection unit, and outputs a value of a counter which uses the selected ATS as an initial value to the packet rewriting unit, the reproduction timing generation unit, and the multiplexing unit, as well as outputs a difference between the ATS initial value of the selected channel which is used as the initial value of the counter and an ATS initial value of other channel to the reproduction timing generation unit,

the reproduction timing generation unit generates timing of multiplexing of the MPEG transport stream that is outputted from the channel reproduction unit, and outputs the generated timing to the multiplexing unit, and

the multiplexing unit multiplexes the MPEG transport streams that are outputted from the channel reproduction unit in accordance with the multiplexing timing that is outputted from the reproduction timing generation unit, and outputs the

multiplexed stream.

2. The image reproduction apparatus of Claim 1 wherein  
the reproduction timing generation unit generates a timing  
such that a reproduction time interval between a Presentation Time  
Stamp (PTS) and a Decoding Time Stamp (DTS) of an arbitrary  
video/audio channel, which are included in the MPEG transport  
stream outputted from the multiplexing unit, becomes equal to a  
time interval between a PTS and a DTS in a MPEG transport stream  
of the original images.
3. The image reproduction apparatus of Claim 1 wherein  
the packet rewriting unit further has a function of rewriting  
a stream, thereby controlling a buffer in a decoding apparatus.
4. The image reproduction apparatus of Claim 3 wherein  
the packet rewriting unit rewrites a stream by rewriting  
vbv\_delay in a MPEG video stream.
5. The image reproduction apparatus of Claim 3 wherein  
the packet rewriting unit further has a function of rewriting  
a coding parameter of a video/audio stream, and monitors a code  
amount of a video/audio stream in a MPEG transport stream at the  
reproduction, thereby optimizing the code amount.

6. The image reproduction apparatus of Claim 1 wherein  
a reproduction control signal for informing switching of  
video between arbitrary channels is inputted to the packet  
rewriting unit and the reproduction timing generation unit, and  
the reproduction timing generation unit generates a PTS and  
a DTS for correcting discontinuity in MPEG video streams resulting  
from the channel switching in accordance with the reproduction  
control signal, thereby correcting discontinuity other than in  
the PTS and the DTS in the MPEG video streams resulting from the  
channel switching.

7. The image reproduction apparatus of Claim 1 wherein  
a reproduction control signal for informing switching of  
video between arbitrary channels is inputted to the reproduction  
timing generation unit, and  
the reproduction timing generation unit generates timing  
of multiplexing of MPEG transport streams for correcting  
discontinuity in the Arrived Time Stamp resulting from the channel  
switching in accordance with the reproduction control signal.

8. The image reproduction apparatus of Claim 1 wherein  
a reproduction control signal for informing switching of  
video between arbitrary channels is inputted to the packet  
rewriting unit and the reproduction timing generation unit, and  
the reproduction timing generation unit has a function of

generating a PTS and a DTS for correcting discontinuity in MPEG video streams resulting from the channel switching in accordance with the reproduction control signal, thereby correcting discontinuity other than in the PTS and the DTS in the MPEG video streams resulting from the channel switching, as well as has a function of generating timing of multiplexing of MPEG transport streams for correcting discontinuity in the Arrived Time Stamps resulting from the channel switching in accordance with the reproduction control signal.

9. The image reproduction apparatus of Claim 6 or 8 wherein the discontinuity other than in the PTS and the DTS in the MPEG video streams resulting from the channel switching is discontinuity in Broken\_link bits in the MPEG video streams.
10. The image reproduction apparatus of Claim 6 or 8 wherein the discontinuity other than in the PTS and the DTS in the MPEG video streams resulting from the channel switching is discontinuity in Continuity\_counter bits in the MPEG transport streams.
11. The image reproduction apparatus of Claim 6 or 8 wherein the packet rewriting unit rewrites a PID so as to prevent a change in a video/audio PID at a time when the channel switching is performed.

12. The image reproduction apparatus of Claim 6 or 8 wherein the packet rewriting unit outputs a dummy MPEG transport stream at the channel switching during a period from when an output of a video stream that is being reproduced stops and to when reproduction of the next stream is started.
13. The image reproduction apparatus of Claim 12 wherein the dummy MPEG transport stream comprises pictures of a low bit rate.
14. The image reproduction apparatus of Claim 12 wherein the dummy MPEG transport stream comprises a picture that is required to decode a start picture of the next stream.
15. The image reproduction apparatus of Claim 12 wherein when the video stream is switched by the channel switching to a stream of a different time period in the same video stream, the dummy MPEG transport stream comprises arbitrary pictures between the last picture in the video stream that is stopped by the channel switching and the first picture in the video stream that will be reproduced next.
16. The image reproduction apparatus of Claim 12 wherein the dummy MPEG transport stream comprises a picture that

is required to decode a start picture of the next stream, or when the video stream is switched by the channel switching to a stream of a different time period in the same video stream, the dummy MPEG transport stream comprises arbitrary pictures between the last picture of the video stream that is stopped by the channel switching and the first picture of the video stream that will be reproduced next.

17. The image reproduction apparatus of Claim 1 further including: a trick-play control unit and a trick-play picture generation unit,

said trick-play control unit transmitting a transmission band that is allocated to trick play and trick-play control information to the trick-play picture generation unit, and

said trick play picture generation unit generating trick-play video/audio on the basis of outputs from the buffer using the transmission band and the control information which are transmitted from the trick-play control unit, and transmitting the generated video/audio to the packet rewriting unit.

18. The image reproduction apparatus of Claim 17 wherein the trick-play control unit changes the transmission band that is allocated to the trick play also in a period when the trick play is being performed, and  
the trick-play picture generation unit generates trick-

play pictures on the basis of the transmission band that is transmitted from the trick-play control unit.